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Appendix O. Wastewater treatment plant (WWTP) effluent temperature and heat loading analysis.

Table O-1. Kooskia WWTP effluent temperature (^{o}C) which would increase receiving water temperatue by 0.3 ^{o}C when the receiving water meets the salmonid spawning temperature criteria.

SF CWR flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)				
	0.015	0.02	0.03	0.04	0.05
100	509.3	384.3	259.3	196.8	159.3
200	1009.3	759.3	509.3	384.3	309.3
300	1509.3	1134.3	759.3	571.8	459.3
400	2009.3	1509.3	1009.3	759.3	609.3
500	2509.3	1884.3	1259.3	946.8	759.3
600	3009.3	2259.3	1509.3	1134.3	909.3
700	3509.3	2634.3	1759.3	1321.8	1059.3

Incremental heat load (million BTU/day) added by effluent, based on effluent and receiving water temperature in table above.

SFCWR flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)				
	0.015	0.02	0.03	0.04	0.05
100	72.83	72.84	72.87	72.90	72.93
200	145.61	145.62	145.65	145.68	145.71
300	218.39	218.41	218.44	218.47	218.50
400	291.18	291.19	291.22	291.25	291.28
500	363.96	363.98	364.00	364.03	364.06
600	436.74	436.76	436.79	436.82	436.85
700	509.53	509.54	509.57	509.60	509.63

Table O-2. Kooskia WWTP heat loading if effluent temperature is capped at 23 ^{o}C when the receiving water meets the salmonid spawning temperature criteria.

SF CWR flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)				
	0.015	0.02	0.03	0.04	0.05
100	23.0	23.0	23.0	23.0	23.0
200	23.0	23.0	23.0	23.0	23.0
300	23.0	23.0	23.0	23.0	23.0
400	23.0	23.0	23.0	23.0	23.0
500	23.0	23.0	23.0	23.0	23.0
600	23.0	23.0	23.0	23.0	23.0
700	23.0	23.0	23.0	23.0	23.0

Incremental heat load (million BTU/day) added by effluent, based on capping effluent temperature at 23 C, and receiving water temperature in table above.

SFCWR flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)				
	0.015	0.02	0.03	0.04	0.05
100	2.04	2.72	4.08	5.43	6.79
200	2.04	2.72	4.08	5.43	6.79
300	2.04	2.72	4.08	5.43	6.79
400	2.04	2.72	4.08	5.43	6.79
500	2.04	2.72	4.08	5.43	6.79
600	2.04	2.72	4.08	5.43	6.79
700	2.04	2.72	4.08	5.43	6.79

Table O-3. Stites WWTP effluent temperature (^{o}C) which would increase receiving water temperature by 0.3 ^{o}C when the receiving water meets the salmonid spawning temperature criteria.

SF CWR flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)							
	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08
100	759.3	384.3	259.3	196.8	159.3	134.3	116.4	103.1
200	1509.3	759.3	509.3	384.3	309.3	259.3	223.6	196.8
300	2259.3	1134.3	759.3	571.8	459.3	384.3	330.7	290.6
400	3009.3	1509.3	1009.3	759.3	609.3	509.3	437.9	384.3
500	3759.3	1884.3	1259.3	946.8	759.3	634.3	545.0	478.1
600	4509.3	2259.3	1509.3	1134.3	909.3	759.3	652.2	571.8
700	5259.3	2634.3	1759.3	1321.8	1059.3	884.3	759.3	665.6

Incremental heat load (million BTU/day) added by effluent, based on effluent and receiving water temperatue in table above.

SF CWR flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)							
	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08
100	72.81	72.84	72.87	72.90	72.93	72.96	72.99	73.02
200	145.60	145.62	145.65	145.68	145.71	145.74	145.77	145.80
300	218.38	218.41	218.44	218.47	218.50	218.52	218.55	218.58
400	291.16	291.19	291.22	291.25	291.28	291.31	291.34	291.37
500	363.95	363.98	364.00	364.03	364.06	364.09	364.12	364.15
600	436.73	436.76	436.79	436.82	436.85	436.87	436.90	436.93
700	509.51	509.54	509.57	509.60	509.63	509.66	509.69	509.72

Table O-4. Stites WWTP heat loading if effluent temperature is capped at 23 °C when the receiving water meets the salmonid spawning temperature criteria.

SF CWR flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)							
	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08
100	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
200	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
300	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
400	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
500	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
600	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
700	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0

Incremental heat load (million BTU/day) added by effluent, based on capping effluent temperature at 23 C, and receiving water temperature in table above.

SF CWR flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)							
	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08
100	1.36	2.72	4.08	5.43	6.79	8.15	9.51	10.87
200	1.36	2.72	4.08	5.43	6.79	8.15	9.51	10.87
300	1.36	2.72	4.08	5.43	6.79	8.15	9.51	10.87
400	1.36	2.72	4.08	5.43	6.79	8.15	9.51	10.87
500	1.36	2.72	4.08	5.43	6.79	8.15	9.51	10.87
600	1.36	2.72	4.08	5.43	6.79	8.15	9.51	10.87
700	1.36	2.72	4.08	5.43	6.79	8.15	9.51	10.87

Table O-5. Grangeville WWTP effluent temperature (^{o}C) which would increase receiving water temperature by 0.3 ^{o}C when the receiving water meets the salmonid spawning temperature criteria.

Threemile Creek flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)				
	0.4	1	1.5	2	2.5
0.1	9.3	9.3	9.3	9.3	9.3
1	9.5	9.4	9.4	9.3	9.3
3	9.9	9.5	9.5	9.4	9.4
5	10.2	9.7	9.6	9.5	9.5
7	10.6	9.8	9.7	9.6	9.5
9	11.0	10.0	9.8	9.6	9.6
10	11.2	10.1	9.8	9.7	9.6

Incremental heat load (million BTU/day) added by effluent, based on effluent and receiving water temperature in table above.

Threemile Creek flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)				
	0.4	1	1.5	2	2.5
0.1	1.24	2.98	4.44	5.90	7.35
1	1.89	3.64	5.09	6.55	8.01
3	3.35	5.09	6.55	8.01	9.46
5	4.80	6.55	8.01	9.46	10.92
7	6.26	8.01	9.46	10.92	12.37
9	7.72	9.46	10.92	12.37	13.83
10	8.44	10.19	11.65	13.10	14.56

Table O-6. Elk City WWTP effluent temperature (^{o}C) which would increase receiving water T by 0.3 ^{o}C when the receiving water meets the federal bull trout temperature criteria.

Elk Creek flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)							
	0.01	0.02	0.03	0.04	0.05	0.1	0.15	0.2
3	31.8	20.6	16.8	14.9	13.8	11.6	10.8	10.4
5	46.8	28.1	21.8	18.7	16.8	13.1	11.8	11.2
10	84.3	46.8	34.3	28.1	24.3	16.8	14.3	13.1
15	121.8	65.6	46.8	37.4	31.8	20.6	16.8	14.9
20	159.3	84.3	59.3	46.8	39.3	24.3	19.3	16.8
25	196.8	103.1	71.8	56.2	46.8	28.1	21.8	18.7
30	234.3	121.8	84.3	65.6	54.3	31.8	24.3	20.6
35	271.8	140.6	96.8	74.9	61.8	35.6	26.8	22.4

Incremental heat load (million BTU/day) added by effluent, based on effluent and receiving water temperature in table above.

Elk Creek flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)							
	0.01	0.02	0.03	0.04	0.05	0.1	0.15	0.2
3	2.21	2.24	2.27	2.30	2.33	2.47	2.62	2.77
5	3.67	3.70	3.73	3.76	3.78	3.93	4.08	4.22
10	7.31	7.34	7.37	7.39	7.42	7.57	7.72	7.86
15	10.95	10.98	11.00	11.03	11.06	11.21	11.35	11.50
20	14.59	14.61	14.64	14.67	14.70	14.85	14.99	15.14
25	18.22	18.25	18.28	18.31	18.34	18.49	18.63	18.78
30	21.86	21.89	21.92	21.95	21.98	22.13	22.27	22.42
35	25.50	25.53	25.56	25.59	25.62	25.77	25.91	26.06

Table O-7. Elk City WWTP heat loading if effluent temperature is capped at 23 °C when the receiving water meets the federal bull trout temperature criteria.

Elk Creek flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)							
	0.01	0.02	0.03	0.04	0.05	0.1	0.15	0.2
3	23.0	20.6	16.8	14.9	13.8	11.6	10.8	10.4
5	23.0	23.0	21.8	18.7	16.8	13.1	11.8	11.2
10	23.0	23.0	23.0	23.0	23.0	16.8	14.3	13.1
15	23.0	23.0	23.0	23.0	23.0	20.6	16.8	14.9
20	23.0	23.0	23.0	23.0	23.0	23.0	19.3	16.8
25	23.0	23.0	23.0	23.0	23.0	23.0	21.8	18.7
30	23.0	23.0	23.0	23.0	23.0	23.0	23.0	20.6
35	23.0	23.0	23.0	23.0	23.0	23.0	23.0	22.4

Incremental heat load (million BTU/day) added by effluent, based on capping effluent temperature at 23 C, and receiving water temperature in table above.

Elk Creek flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)							
	0.01	0.02	0.03	0.04	0.05	0.1	0.15	0.2
3	1.36	2.24	2.27	2.30	2.33	2.47	2.62	2.77
5	1.36	2.72	3.73	3.76	3.78	3.93	4.08	4.22
10	1.36	2.72	4.08	5.43	6.79	7.57	7.72	7.86
15	1.36	2.72	4.08	5.43	6.79	11.21	11.35	11.50
20	1.36	2.72	4.08	5.43	6.79	13.59	14.99	15.14
25	1.36	2.72	4.08	5.43	6.79	13.59	18.63	18.78
30	1.36	2.72	4.08	5.43	6.79	13.59	20.38	22.42
35	1.36	2.72	4.08	5.43	6.79	13.59	20.38	26.06

Table O-8. Red River Ranger Station effluent temperature (^{o}C) which would increase receiving water temperature by 0.3 ^{o}C when the receiving water meets the federal bull trout temperature criteria.

SF Red River flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)					
	0.002	0.004	0.006	0.008	0.01	0.02
5	196.8	103.1	71.8	56.2	46.8	28.1
10	384.3	196.8	134.3	103.1	84.3	46.8
20	759.3	384.3	259.3	196.8	159.3	84.3
30	1134.3	571.8	384.3	290.6	234.3	121.8
40	1509.3	759.3	509.3	384.3	309.3	159.3
50	1884.3	946.8	634.3	478.1	384.3	196.8
60	2259.3	1134.3	759.3	571.8	459.3	234.3

Incremental heat load (million BTU/day) added by effluent, based on effluent and receiving water temperature in table above.

SF Red River flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)					
	0.002	0.004	0.006	0.008	0.01	0.02
5	3.64	3.65	3.66	3.66	3.67	3.70
10	7.28	7.29	7.30	7.30	7.31	7.34
20	14.56	14.57	14.57	14.58	14.59	14.61
30	21.84	21.85	21.85	21.86	21.86	21.89
40	29.12	29.12	29.13	29.14	29.14	29.17
50	36.40	36.40	36.41	36.41	36.42	36.45
60	43.68	43.68	43.69	43.69	43.70	43.73

Table O-9. Red River Ranger Station WWTP heat loading if effluent temperature is capped at 23 °C when the receiving water meets the federal bull trout temperature criteria.

SF Red River flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)					
	0.002	0.004	0.006	0.008	0.01	0.02
5	23.0	23.0	23.0	23.0	23.0	23.0
10	23.0	23.0	23.0	23.0	23.0	23.0
20	23.0	23.0	23.0	23.0	23.0	23.0
30	23.0	23.0	23.0	23.0	23.0	23.0
40	23.0	23.0	23.0	23.0	23.0	23.0
50	23.0	23.0	23.0	23.0	23.0	23.0
60	23.0	23.0	23.0	23.0	23.0	23.0

Incremental heat load (million BTU/day) added by effluent, based on effluent and receiving water temperature in table above.

SF Red River flow above WWTP outfall (cfs)	WWTP Effluent Discharge (cfs)					
	0.002	0.004	0.006	0.008	0.01	0.02
5	0.27	0.54	0.82	1.09	1.36	2.72
10	0.27	0.54	0.82	1.09	1.36	2.72
20	0.27	0.54	0.82	1.09	1.36	2.72
30	0.27	0.54	0.82	1.09	1.36	2.72
40	0.27	0.54	0.82	1.09	1.36	2.72
50	0.27	0.54	0.82	1.09	1.36	2.72
60	0.27	0.54	0.82	1.09	1.36	2.72